

October 30, 2006

How to Curb “High Quality” Terrorism?

by **Jean-Paul Azam**

University of Toulouse (ARQADE and IDEI),
and Institut Universitaire de France.

Abstract: Some recent statistical work has brought out that terrorists have a relatively high educational background. This can be explained in this model where the decision to invest in education is endogenous. The alternative outlets for educated labor, beside skilled jobs, create a wage floor in the latter’s market. The resulting labor market equilibrium may leave some educated workers with a choice between accepting a low-paying job and engaging in terrorism. The model predicts that aid should aim at boosting demand for skilled labor, while some counter-terrorist actions are counter-productive.

Acknowledgements: This paper has been presented as the keynote speech to the 4th Development Economics PhD Seminar, at the University of Namur. It has benefited from comments by many participants, and in particular by Jean-Marie Baland and Jean-Philippe Platteau. Useful comments by Guido Friebel and Lorenzo Rocco on a previous version are also gratefully acknowledged, without implicating. This paper is part of the PAC Project CIT-2-CT-2004-506084 funded by the European Commission.

Author’s Addresses:

Jean-Paul Azam

ARQADE, University of Toulouse 1,
21 Allée de Brienne, 31 000 Toulouse, France.

E-mail : azam@univ-tlse1.fr

“In general, the higher the level of education of the unemployed, alienated or otherwise dissatisfied person, the more extreme the destabilizing behavior which results” (Huntington, 1968, p. 48)

1. Introduction

The “quality of terror” has recently emerged as an empirical puzzle (Bueno de Mesquita, 2005). Some data presented by Krueger and Maleckova (2003) show that terrorists, especially from the Hezbollah, have on average a higher level of education than the rest of their population of origin, and come from a relatively wealthy family background. A similar pattern has been found also among the Leftist terrorists in Europe in the 1970s, as well as among other groups. These data thus rule out the widespread view that poverty breeds terrorism. This has raised a major discussion about aid policy. The Bush administration has claimed on several occasions that it aimed at stepping up its aid to developing countries as part of its war on terror, emphasizing in particular an effort for reducing poverty and boosting education. This theme was launched in a much-quoted speech given in Monterrey on March 22, 2002, where George W. Bush said: “We fight against poverty because hope is an answer to terror” (see Krueger and Maleckova, 2003, and Sachs, 2005). The “Millennium Challenge Account” has been created in the wake of this speech for channeling aid to poor countries, with an emphasis on poverty alleviation and education. The data brought out by Krueger and Maleckova (2003) have been used for opposing this view of aid as a means to curb terrorism. Because terrorists, and in particular suicide-bombers, are predominantly recruited from relatively wealthy family backgrounds, and have a relatively high educational level, the Bush administration’s proclaimed policy might seem paradoxical. Some fear that providing support for expanding education in poor countries, or for alleviating poverty, might backfire by increasing the supply of terrorists.

Bueno de Mesquita (2005) has pointed out that these data do not allow to conclude that economic problems like poverty are irrelevant for terrorist activity. Although terrorists are found in the upper tail of the income distribution, the data suggest that the occurrence of terrorist attacks is negatively correlated with shifts of that distribution. Several empirical

papers have shown that economic downturns are in fact significant for explaining upsurges in terrorist attacks (Blomberg *et al.* 2004, Li, 2005). Bueno de Mesquita (2005) presents a potential mechanism for explaining jointly these two sets of stylized facts. In his model, poor and uneducated people have as strong an incentive as richer and more educated ones for supplying their lives for terrorist missions. However, the terrorist organizations have an incentive to recruit the most educated ones, because they are probably more reliable for performing their mission. Nevertheless, economic shocks do affect the supply of terrorists in that model, through the level of mobilization. Azam (2005) follows a different route, and assumes that educated people have a stronger concern for the welfare of the future generations. This stronger altruistic feeling leads them to engage more decisively in terrorist activities, described as a means for increasing the probability of the next generation benefiting from some public good like freedom or national independence. Then, an equilibrium may prevail where the most educated people, i.e. those who care the most for the next generation, will systematically engage in suicide bombing in the hope that this will enhance the chances of the next generation getting the public good. Economic conditions enter the model through the opportunity cost of engaging in a terrorist attack. That model is then used for discussing the scope for aid policy to reduce terrorism. In that framework, conditional aid can be effective against terrorism if it tilts the trade off that the terrorist is facing between bombing today and the probability of the next generation getting the public good.

In general, the analytical literature has rather discussed the issue of curbing terrorism in terms of repression, or “crackdown”. Bueno de Mesquita’s “quality of terror” model discusses both the effects of standard counter-terrorism, based on repression, and those of aid, as a means to fight terrorism (Bueno de Mesquita, 2005). While the impact of the latter is rather tenuous, that model brings out that “crackdown” might be counter-productive, by increasing mobilization, and thus boosting the supply of volunteers that the terrorist organizations can choose from. Rosendorff and Sandler (2004) also find that crackdown can become a counter-productive policy. In that model, too harsh an attack on terrorism might trigger an increase in grievances, because of its negative fallout on the general public, which backfires by increasing terrorist activity.

The present paper aims at contributing some additional arguments to this debate on aid *versus* crackdown, for curbing terrorism. It uses a simple model where the decision to invest in education is endogenous. Workers have to decide up front whether they want to acquire education or not, and then whether they want to work or go for a terrorist mission instead. Education has two effects on those who acquire it: (i) it changes their worldview, and (ii) it increases the probability that they get a high-paying job offer. The “worldview” effect (i) is directly related to Akerlof’s “loyalty filter” theory briefly highlighted by the following quote: “When people go through experiences, frequently their loyalties, or their values, change. I call these value-changing experiences “loyalty filters”” (Akerlof, 1983, p.54). Here, changing their worldview is taken to mean that the value that they attach to terrorist activity might be strongly increased as a response to education, with some probability¹. This creates an additional outlet for skilled labor, in terrorism. Together with the possibility of accepting an unskilled job, this gives rise to a wage floor in the relevant segment of the labor market. Then, the market equilibrium might be such that only a fraction of the educated workforce will get a high-paying job offer, the other ones choosing either to work for a lower wage, or to go for a terrorist mission instead. Hence, the level of economic activity enters this model through the demand for skilled labor. This simple model is used for discussing the issue of the choice between aid and crackdown for curbing “high-quality” terrorism. While the prognosis is quite favorable for some kinds of aid policies, this model suggests that crackdown might be counter-productive, as in Bueno de Mesquita (2005) and Rosendorff and Sandler (2004), mentioned above. However, the predicted response is quite different in the present model, because it is non-monotonic. Piecemeal counter-terrorist actions are counter-productive, while a massive crackdown could potentially eradicate terrorism.

The next section discusses the microeconomic foundations of the worker’s choice, first between investing in education, or not, and second between working and turning to terrorism

¹ Paz (2000) documents the simultaneous increase in higher education and militancy among Palestinian youths. Similarly, Reuter (2004) provides a lot of journalistic information on suicide bombers, suggesting that militancy is often acquired through education. Stern (2003) presents other examples of terrorists from various religious backgrounds. Omar Sheikh, the mastermind behind Daniel Pearl’s murder and a former student of the London School of Economics, is an illuminating one (see also Lévy, 2003).

instead. Section 3 analyzes the conditions to be imposed on the parameters for getting a positive supply of terrorists while capturing some features of the real world described above. Section 4 describes the equilibrium of the model, and discusses its existence and stability. Section 5 derives the comparative-statics predictions mentioned above, and sketches the design of counter-terrorist strategies that this model brings out. The conclusions are drawn in section 6.

2. Betting on Education

In this model, a potential worker must first choose whether to get a fixed amount of education or not. There are two types of workers, who incur a different cost $\delta \in \{\delta_L, \delta_H\}$, $\delta_L < \delta_H$ for acquiring this fixed amount of education. This may be viewed as a portmanteau parameter liable to capture the prospective student's innate ability, his or her family background, etc. This parameter can be used for capturing some social polarization, reflected in a differential access to education among social groups. Azam (2005) discusses also how social heterogeneity might affect the supply of terrorists. In several Middle-Eastern countries, terrorist organizations like Al-Qaeda or Hamas have a social arm that provides or helps financing education services. This undoubtedly reduces the cost of education for the beneficiaries. Ly (2006) discusses why some of these terrorist organizations have both a charitable branch and a terrorist one. He suggests that vertical integration, whereby charity and terror are produced by the same organization, has a dampening effect on terrorist activity, by internalizing the latter's negative externalities. A related result is discussed below. However, many more students go through these educational institutions than the ones who turn eventually to the *Jihad*, including terrorism (See Paz, 2000, Reuter, 2004, and Stern, 2003). Hence, it is safe to assume that the *ex ante* cost of education does not depend on whether the educated worker chooses *ex post* to work or to go for a terrorist mission instead.

In the present model, this level of education is acquired instantly by those who choose to do so. In the real world, of course, acquiring education takes some time, so that the equilibrium described below should be viewed as a medium-run outcome, and not as a short-run situation. Then, the equilibrium wages and skilled-labor employment rate derived below

should be understood as Rational Expectations Equilibrium outcomes, in order to take into account that time passes in the real world between the decision to acquire education and the actual supply of labor on the job market. Then the decision to acquire education must be based on the expected value of the wage rates and skilled-labor employment level prevailing at the end of the education process. However, a full-blown analysis of this issue would require a dynamic model with successive generations, which would detract attention from the main focus of the paper. The simple set up used here is sufficient for making its main point.

Education is doing two things to the people who acquire it. It affects their worldview, as described below, and gives them access to the high-paying segment of the labor market. Then, the worker will either get a skilled-labor job offer, or not, depending on the state of the market. Denote w_L the market wage rate for unskilled labor, and $w_H > w_L$ the skilled-labor wage rate. No skilled-labor job is offered to uneducated workers, while the educated ones do not necessarily get such an offer with probability 1. Instead, the skilled-labor market is assumed to function in such a way that the educated worker only gets a high-paying job offered with probability π , which might be strictly below 1 in equilibrium. The latter is treated parametrically by the worker, but it depends on the state of the labor market. It is determined endogenously, as described in section 4 below. High-paying jobs are allocated randomly among educated workers, who are treated equally by the market, but there might not be enough of these for all of them. With the complementary probability, the educated worker is offered a low-paying job instead². At this point, the worker can choose whether to

² One can think of this job-market lottery as a random matching model where all the educated workers are equivalent from the firm's point of view. For simplicity, assume first that there is the same number of firms and of educated workers. A fraction π of the firms has one high-paying job to offer at the equilibrium wage and signs a binding contract with the first educated worker who knocks at the door and accepts the job. The educated workers only know the probability π and not which firms have such a job to offer. They choose simultaneously which door to knock at and when two or more of them happen to choose the same door, the first one to get in is picked at random. They might thus end up knocking at the door of a firm that does not offer such a job with the complementary probability. Those who did not get a contract go and knock at another door until all the available high-paying jobs are allocated. It is then trivial to extend this reasoning to the case of a lower number of identical firms offering a correspondingly larger number of such jobs.

accept the job offered, whichever it is, or go for a terrorist mission instead. The value attached to the latter depends on the person's worldview.

The worker can choose to become a terrorist if he or she attaches a high enough value to performing a terrorist mission. As argued in Azam (2005), the latter is likely to be affected by the educational status of the person who is facing this choice. For the sake of simplicity, assume that the uneducated ones attach a fixed value V to their performing such an attack. It seems natural to assume that people who are facing the choice of investing in education do not know precisely what impact this would have on their worldview, and hence on the value that they attach to performing a terrorist mission. Assume instead that they form expectations about this, based on a known probability distribution. With probability μ , they acquire a high value for a terrorist mission $V_H > V$, whereas they get with the complementary probability $1 - \mu$ a lower value for it $V_L \leq V$. This way of modeling the "worldview" effect is flexible enough to accommodate various interpretations. My favorite one is that education reveals his or her own type to the person who invests in it. In this case, it is natural to assume that $\mu V_H + (1 - \mu)V_L = V$, as those who remain uneducated are content with an uncertain worldview, given the cost of education that they are facing. This fairly Socratic view is consistent with the discussion by Victoroff, a psychiatrist, suggesting that terrorists belong to well-defined psychological and moral types, activated by the individual's cultural and cognitive experience (Victoroff, 2005). However, for the purpose at hand, the sketchy assumption used here is sufficient. Beside the effect of education, all other potential determinants of such a value are neglected.

In Azam (2005), the value of the terrorist attack for the potential bomber depends also on the total number of attacks performed by all the terrorists, and on the value of some future public good for the next generation. These additional effects can be neglected as a first approximation in the present model, given the labor-market focus of the present analysis. Nevertheless, various subjective characteristics of the potential students can be taken on board by combining the V and δ types. For example, the latter portmanteau parameter can be used for capturing some risk aversion, which could affect the choice of investing in education made by some people. Hence, a high value of δ_H could be used to capture the attitude of some

potential students who are afraid to discover their true V type. Instead of just risk aversion, this parameter could also capture the effect of a strong commitment not to become a terrorist. Hence, some people might simply eschew the opportunity of acquiring education because they are not prepared to run the risk of becoming a terrorist. Moreover, this parameter can also be used for capturing the effect of decisions made by the parents of potential terrorists at an early stage. Most terrorists are about 20 years of age or more, and have certainly had a say in the decision to pursue a course of study to that age. However, the parents have various means for influencing this decision. For example, some parents might not let their children complete primary education or might take them out of high school at an early stage in order to preempt their decisions to be made at a later age to go for further education and thus run the risk of becoming terrorists. Then, these parents are strategically imposing a high δ_H on their children for affecting their choice.

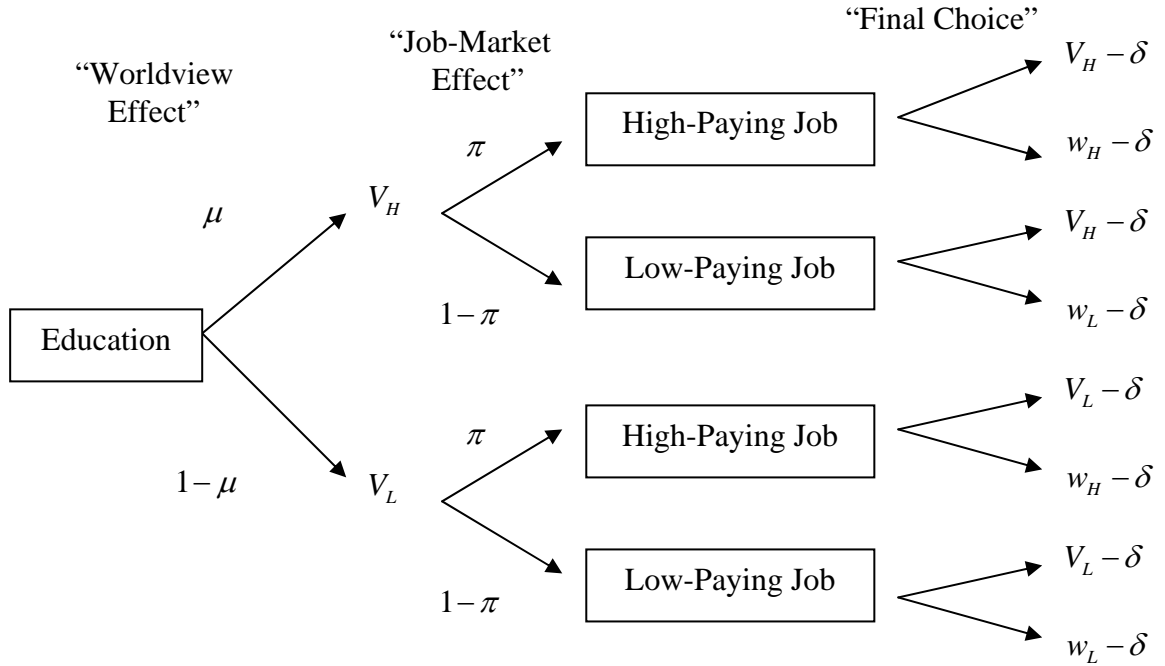


Figure 1: The Educated Worker's Decision Tree

Figure 1 depicts the decision tree corresponding to the choices made by the educated worker. A first random draw determines his or her worldview, and hence the value this person attaches to a terrorist mission. A second random draw determines what kind of job offer he or

she gets from the market. Given these two parameters, the educated worker has to make a choice between accepting the job offered and going for a terrorist mission instead. The decision made at this final stage determines the expected rate of return on education.

Although the order in which the person's worldview and wage offer are revealed in figure 1 seems quite natural, it is immaterial for the analysis performed below. What matters is that each educated person is getting a random draw yielding a pair $\{V_i, w_i\}, i \in \{H, L\}$, with the probabilities summarized at table 1. It is also natural to assume as we do here that the probability of getting a high-paying job offer is independent of the worldview acquired by the student. Otherwise, we would need to assume that potential employers would be able to observe V_i , and this information could easily be used for arresting those who get a $\{V_H, w_L\}$ draw, i.e. those who are choosing to engage in terrorist activity in the equilibrium described below, and thus to help the police preventing these terrorist attacks.

Table 1: Probability Distribution over $\{V_i, w_i\}$

	V_L	V_H
w_L	$(1-\mu)(1-\pi)$	$\mu(1-\pi)$
w_H	$(1-\mu)\pi$	$\mu\pi$

3. Conditions for a Positive Supply of Terrorists

Now, given the data briefly described in the introduction, we are interested in analyzing an equilibrium outcome where some of the educated people, but certainly not all of them, choose to go for a terrorist mission, while uneducated ones do not. The latter outcome occurs quite obviously if $w_L > V$. This expression means that the value attached to a terrorist mission by an uneducated worker is not high enough for dragging the uneducated people out of their low-paying job for engaging in terrorist activity. This assumption is polarizing too much the educational status of the terrorists, as the data discussed above are only saying that on average terrorists are more educated than the rest of the population, and not that they are exclusively recruited among educated people. However, the stylization adopted here is

convenient for analytical purposes, as it helps focusing the analysis on the main empirical puzzle. Bueno de Mesquita (2005) has made a similar simplifying assumption.

Then, we want an equilibrium outcome where some people do acquire some education, while some others do not. The following chain of inequalities is required for this outcome, although it is not sufficient:

$$w_H - \delta_L > w_L > w_H - \delta_H. \quad (1)$$

This condition ensures that the workers of the H -type, i.e. those facing a high cost of education, will not acquire any, and will go to the unskilled-labor market directly. It also means that the L -type workers would choose to get educated if they were certain of getting a high-paying job. Let us also restrict the analysis to cases where the following chain of inequalities holds:

$$w_H > V_H > w_L. \quad (2)$$

The latter entails that only the educated workers of the V_H type will choose to go for a terrorist mission, with probability $1 - \pi$, i.e. if they get a low-paying job offer. Otherwise, these workers accept the high-paying job that the market offers to them. This assumption is consistent with the interpretation offered by some observers of the choice of becoming a terrorist as a way to enhance one's self esteem (e.g. Reuter, 2004). Here, one could say that the educated worker has two possible ways of enhancing his or her self esteem, by either getting a high-paying job, or by going for a terrorist mission instead of accepting a low-paying job. The educated workers of the V_L type will accept any job offer they get, rather than going for a terrorist mission. Under one further condition spelt out below, these conditions also open the way for making the acquisition of some education profitable for the L -type workers, i.e. those facing a low cost of acquiring education. However, their decision will in fact depend on the state of the relevant segment of the labor market.

Now, the L -type workers will choose to get educated if the market gives them a high enough probability of getting a high-paying job. Otherwise, they would rather go directly for

the unskilled-labor segment of the market, without investing in education first. For the sake of simplicity, assume that these workers are not affected by risk aversion, beside the latter's potential effect on their δ . Then, they will choose to invest in education if the expected return on doing so is higher than that on going directly to the unskilled segment of the labor market. This occurs if:

$$\mu \left[\pi (w_H - \delta_L) + (1 - \pi) (V_H - \delta_L) \right] + (1 - \mu) \left[\pi (w_H - \delta_L) + (1 - \pi) (w_L - \delta_L) \right] \geq w_L. \quad (3)$$

This expression takes first into account the assumption that the educated worker of the V_H type will only get a high-paying job with probability π , and that otherwise, which occurs with probability $1 - \pi$, he or she prefers to go for a terrorist mission. By contrast, the V_L type will accept either kind of job offer.

Condition (3) is more easily interpreted when written in terms of the marginal expected benefit brought about by education, or educational profit function. This brings out how the “worldview effect” of education works as a partial insurance mechanism, which affects positively the demand for education by workers of the relevant type. This marginal benefit condition requires the educational profit to be positive, and can be written as:

$$\pi (w_H - w_L) + (1 - \pi) \mu (V_H - w_L) - \delta_L \geq 0 \quad (4)$$

This expression clearly shows that investing in education may yield a premium $V_H - w_L$ over and above the low wage rate with probability μ for the educated person, should the latter draw a bad offer from the labor market. This simply reflects the value of this person's preferred course of action. The “worldview effect” is thus reducing the downside risk involved when all the educated persons do not get a high-paying job offer with probability 1. This is a measure of the value of the information acquired about him- or herself by the educated person. It contributes positively to making investment in education attractive for the L -type workers.

Nonetheless, condition (3) creates a floor below which the skilled labor wage cannot fall. Otherwise, the supply of educated workers would fall to zero. This wage floor involves a

trade off between w_H and π , so that a low probability of getting a high-paying job must be compensated by a high wage rate in such a job for making education worthwhile, and vice versa. This trade off may be written as:

$$w_H \geq w_L + \delta_L + \left(\frac{1-\pi}{\pi} \right) [\delta_L - \mu(V_H - w_L)]. \quad (5)$$

For the sake of consistency with condition (1) above, we need $w_H > w_L + \delta_L$. Otherwise, even the workers of the L -type, i.e. those with a low cost of education, would never acquire any education, violating one of the stylized facts that we want to impose on our equilibrium outcome, as explained above. Hence, the wage floor (5) is irrelevant, unless the following condition holds:

$$\mu < \frac{\delta_L}{V_H - w_L}. \quad (6)$$

Then, the weak inequality in (5) can hold all the way down to its lower bound, i.e. with equality. This condition requires that the probability of acquiring the V_H type by education be low enough. Let us restrict the analysis to this case, as it is realistic to assume that the probability of becoming a terrorist after acquiring education is rather small.

The right-hand side of (5) shows that the skilled-labor wage floor depends on π , with a negative slope. This captures the trade-off mentioned above. Notice that V_H also enters the wage floor with a negative sign. This reflects the partial compensation that it entails for an educated worker of the relevant type who gets a low-paying job offer. Hence, it helps sustaining the supply of educated workers, by providing some partial insurance against a bad draw in the educated-labor job market, as explained above.

The next section analyzes how this wage floor affects the working of the skilled-labor market, and may entail a positive supply of terrorists in equilibrium.

4. Equilibrium in the Skilled-Labor Market.

Assume now that the demand for skilled labor is given by the following function, while (5) holds:

$$L(K, w_H, w_L), \quad (7)$$

which is increasing in K . The latter measures the capital stock, or any other variable affecting positively the demand for skilled labor, for any given wage rate. For example, the level of technology is subsumed in this variable. In particular, we assume below that it depends positively on aid, provided the latter is targeted explicitly at boosting the demand for skilled labor. In other words, K is a shorthand notation for any variable that affects positively the demand for skilled labor, including for example any employment subsidy granted by the government for supporting the demand for educated labor, which might be funded by foreign aid. Naturally, the skilled-labor demand function in (7) is decreasing in both w_H and w_L .

As far as the demand for unskilled labor is concerned, the simplest possible assumption is that it is infinitely elastic at a fixed level of labor productivity $\alpha > V$, at least in some neighborhood of the equilibrium point. This assumption is sufficient for the purpose at hand. Consequently, equilibrium entails:

$$w_L = \alpha. \quad (8)$$

Then, a labor-market equilibrium in this model is a $\{w_L, w_H, \pi\}$ triplet such that (5) and (8) hold, as well as (10) below, while:

$$w_H = \alpha + \delta_L + \left(\frac{1-\pi}{\pi} \right) [\delta_L - \mu(V_H - \alpha)] \text{ if } \pi < 1. \quad (9)$$

The latter captures the standard idea of wage flexibility, taking into account that (5) imposes a floor on the value of the equilibrium wage rate for skilled labor. If full employment prevails on this segment ($\pi = 1$), then condition (5) might not be binding, and w_H might settle above that floor. However, what may create excess supply on this market, with $\pi < 1$, is

that the wage rate is prevented from adjusting downwards by the wage floor given by (5). If the skilled-labor wage rate was to fall below this wage-floor, then the supply of educated workers would fall to zero, thus creating obviously a state of excess demand. The latter would push this wage rate upwards until (5) held again. Hence, in a labor-market equilibrium where not all the educated workers get a high-paying job offer, (9) must hold³.

Lastly, assume that there are a fixed number N^S of L -type workers. Then, equilibrium on the skilled-labor segment of the labor market obtains when the probability of finding a high-paying job is correctly perceived by the workers, i.e. when:

$$L(K, w_H, \alpha) = \pi N^S. \quad (10)$$

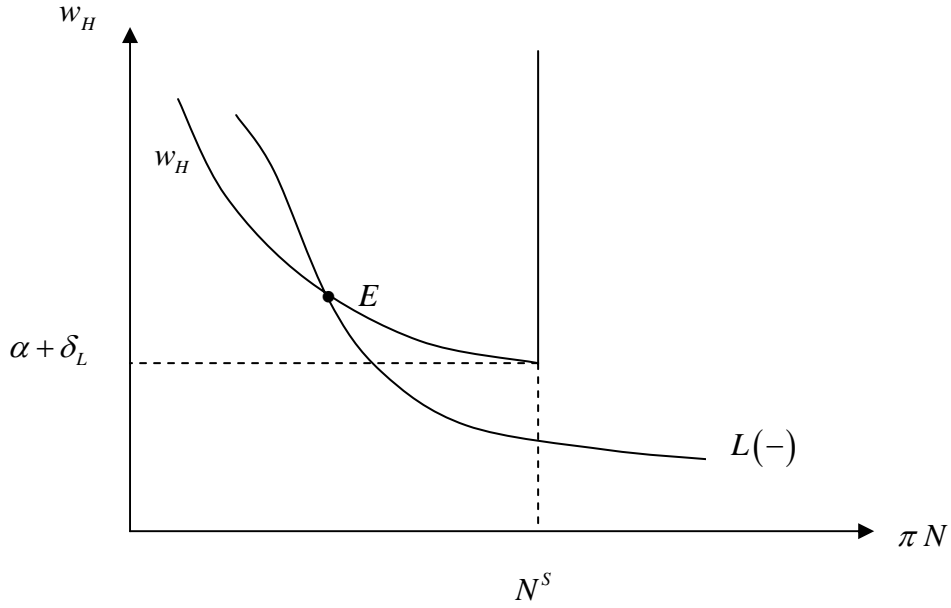


Figure 2: Skilled-Labor Market Equilibrium

The trade off between w_H and π entailed by (5) is making the equilibrium skilled-labor wage curve forward-falling for any level of employment below $\pi = 1$, provided (6) holds, as assumed above. Point E in figure 2 depicts an equilibrium outcome where some of the educated workers are unable to find a high-paying job, some of them going for a terrorist

³ Notice that (3) is binding also in this type of equilibrium by construction, so that each L -type worker is just indifferent between getting educated or not.

mission instead⁴. This entails of course that the supply of terrorists is positive and equal to $N^T = \mu(1-\pi)N^S$, while $(1-\mu)(1-\pi)N^S$ educated workers are in fact accepting a low-paying job. Hence, given μ and N^S , the equilibrium supply of “high-quality” terrorism is jointly determined with π , the probability that an educated worker gets a high-paying job offer. Notice that the equilibrium point might fail to exist for this market, were the demand curve to lie entirely below the wage floor. The reason for this non-existence possibility is that it is natural to assume that $L(-)$ would fall to zero for some finite and very high level of w_H , while (9) shows that the latter would tend to infinity as $\pi \rightarrow 0$. In that case, this economy would have neither terrorism, nor educated workers. This case of peaceful stagnation is further discussed below. On the other hand, the skilled-labor demand curve might also be located so high as to cut the supply curve above the wage-floor, in which case no educated worker would choose to engage in terrorism. Let us focus on the intermediate cases like point E where the supply of terrorists is positive in equilibrium.

Stability is discussed by looking at the response of demand and supply of educated workers to shocks affecting w_H , assuming that the firms are facing no adjustment costs, and are thus “on” their demand curve. This equilibrium is stable, provided the demand curve cuts the wage floor from above. Then, if the wage rate was shocked above E , excess supply would drive it back to equilibrium, while if it was shocked below E , supply would fall to zero, lifting the wage rate back up to equilibrium⁵. Algebraically, this condition may be derived from (9) and (10) as:

⁴ This diagram must be understood as follows. The x-axis is labeled πN , where the supply of skilled labor is $N = N^S$ if the $\{w_H, \pi N^S\}$ pair is located on or above the wage floor. Below this, $N = 0$, and π is formally indeterminate. For all the points on or above the wage floor, we are thus working in the $\{w_H, \pi\}$ space, using simply N^S as a normalizing scalar.

⁵ If we wanted to take explicitly into account the time required for acquiring education, then this equilibrium should be understood as a Rational Expectations Equilibrium (REE), as mentioned above. In that case, its stability should be discussed within the “eductive” learning framework described by Guesnerie (2001). In that framework, players learn the REE prices in virtual time by a mental process using Common Knowledge considerations. There is no real-time “groping” of prices to their equilibrium values, which are established immediately. Developing explicitly such an analysis here would take us too far and divert attention from the main point of the paper.

$$\pi > (\delta_L - \mu[V_H - \alpha]) \left(\frac{-\partial L}{L(-) \partial w_H} \right). \quad (11)$$

This expression means that stability is obtained when the employment rate of skilled workers in high-paying jobs is high enough, given the slope of the demand curve. This is a reflection of the convexity of the wage floor, which makes it steeper, the lower is this employment rate.

5. Implications for Counter-Terrorist Policies

This simple diagram can be used for performing some comparative-static exercises. Four parameters can change in this model, and can be used for simulating the impact of some policies. The first interesting change that can be performed may be interpreted as simulating the impact of a policy for reducing poverty by “empowering” the uneducated workers. A natural way to think about this is to look at the impact of a potential increase in α . Figure 2 and expression (9) make clear that the impact of such a measure would be to shift the wage floor upwards, while rotating it clockwise also. This effect comes from the reduction in the relative attractiveness of getting educated, when unskilled jobs are paying better. Moreover, (10) implies that the demand curve would shift to the left. These two effects would push the equilibrium point to the north-west along the demand curve, itself located in a lower position, thus increasing skilled-labor under-employment and the supply of terrorists. Hence, this exercise is providing some support to the skeptical view expressed by Krueger and Maleckova (2004) about the role of poverty reduction in the fight against terrorism.

A second parameter of interest is δ_L , which measures the cost of acquiring education for the target population of L -type workers. A policy of subsidizing education for the L -type would shift the wage floor downwards, while rotating it counter-clockwise. This would lead to a south-easterly move of E along the demand curve. Hence, this would increase the probability of the educated workers getting a high-paying job, and would thus reduce the supply of terrorists. This effect is channeled by the increase in the net return on an investment in education, thus requiring a lower wage rate for the latter to be worthwhile. This result

provides a qualified support to the Bush administration's claim that educational assistance to the relevant countries could help curbing terrorism. The qualification is that this assistance should be targeted at the L -type workers, those who are facing a low cost of education.

The third parameter of interest is V_H , the value attached by the most militant educated workers to performing a terrorist attack. We can think of this as the main channel of impact of a counter-terrorist policy that would increase the cost of performing an attack. For example, an increased defense force, backed by a highly performing intelligence service, might make it harder to hit the target, by increasing the chances of being caught by the army or the police before reaching the right place. Then, the potential terrorist would either be killed or sent to jail without the benefit of having achieved his or her goal. A glance at (9) shows that reducing V_H would make the trade off steeper, rotating the wage floor clockwise in figure 2. This is clearly counterproductive, by pushing the equilibrium point upwards along the demand curve, at least as long as $V_H > w_L$. The reduced value of a terrorist attack for the V_H type is simply making investment in education more risky for the prospective student, requiring a higher expected wage rate in compensation. Below that point, the counter-terrorist policy would simply have no effect, as no educated worker would then prefer going for a terrorist attack to accepting a low-paying job. From this point down, V_H is replaced by α in (9), so that any further effort made for repressing terrorism would be wasted, having no effect on the supply of "high-quality" terrorists. Hence, this model leads to the prediction that the impact of counter-terrorist actions, aimed at reducing the value attached by the educated workers to terrorist attacks, is likely to be non monotonic. Then, only a massive crackdown could eradicate terrorism, while a more modest effort, falling short of getting $V_H \leq w_L$, would in fact produce the perverse effect of boosting the supply of terrorists. Hence, for a non empty range of initial values of V_H , the model predicts that a "radicalization" process would respond to increased repression. A larger number of terrorists would then challenge the hardened target. Moreover, any effort made for reducing the value attached to a terrorist mission by any other type of worker would be entirely wasted, with no impact whatsoever on the supply of terrorists. In other words, a crackdown policy should be (i) large enough, and (ii) finely targeted, if any favorable impact is to result from it. The fine targeting requirement may be

interpreted as putting the emphasis on intelligence as the fundamental input in counter-terrorist repression.

The latter two comparative-static exercises shed some interesting light on the issue of the charitable activities of terrorist organizations. As mentioned above, Ly (2006) has tackled this issue, and suggests that vertical integration of charitable and terrorist organizations tends to reduce terrorist activity relative to a situation where these two types of activities were separately performed. A related result can be derived from the present model. As mentioned above, terrorist organizations like the Hamas or the Hezbollah are filling in the vacuum of government-provided social services in some Middle-Eastern countries. In particular, they provide directly or help funding education and health services, while they are known to use these charitable activities as a vehicle for their propaganda (see Ly, 2006). One can capture these observations by assuming that their charitable activities are reducing δ_L , by reducing the cost of acquiring education, and increasing V_H , by enhancing the value attached by some students to terrorist activity, through their propaganda. In the present model, within the relevant range, these two changes are working in the same direction, that of reducing the supply of terrorist attacks. Hence, the present model concurs with Ly's in predicting that the charitable activities of terrorist organizations are in fact dampening the terrorist threat. However, not all the terrorist organizations are involved in providing education and health services, and the Islamic Jihad, for example, is purely specialized in terrorist attacks.

The last parameter of interest is K , which affects positively the demand for skilled labor. An increase in this variable might be used for capturing the effect of a conditional increase in aid that would be entirely directed at boosting the demand for skilled labor. This could simply be done by funding a wage subsidy for hiring educated workers, or more indirectly by investing massively in some high-skill activity, like the outsourcing of computing services, etc. Then, this would shift the demand curve to the right, thus pushing the equilibrium point towards the south-east. By increasing the probability of an educated worker getting a high-paying job, this would clearly reduce the supply of terrorist missions. Furthermore, by increasing K by a large enough amount, terrorism could be eradicated entirely in this model. A much discussed substitute to this kind of aid is migration of educated

workers from poor countries, often discussed under the value-laden label of “brain drain”. The analysis performed here is certainly adding an argument in favor of easing the barriers erected by rich countries against immigrants from poor countries, at least if they have acquired a high enough education level. Various industrialized countries, including the USA, Britain and France, have adopted a policy that makes immigration from poor countries much easier for educated people than for unskilled ones. One argument raised against this view is that some of these immigrants might become terrorists against their host country, as illustrated by the bombing of London’s underground in 2005. However, Al-Qaeda would probably have substituted easily for the resident volunteers, were the latter in short supply. This is an empirical issue, which is clearly falling outside the scope of the present paper.

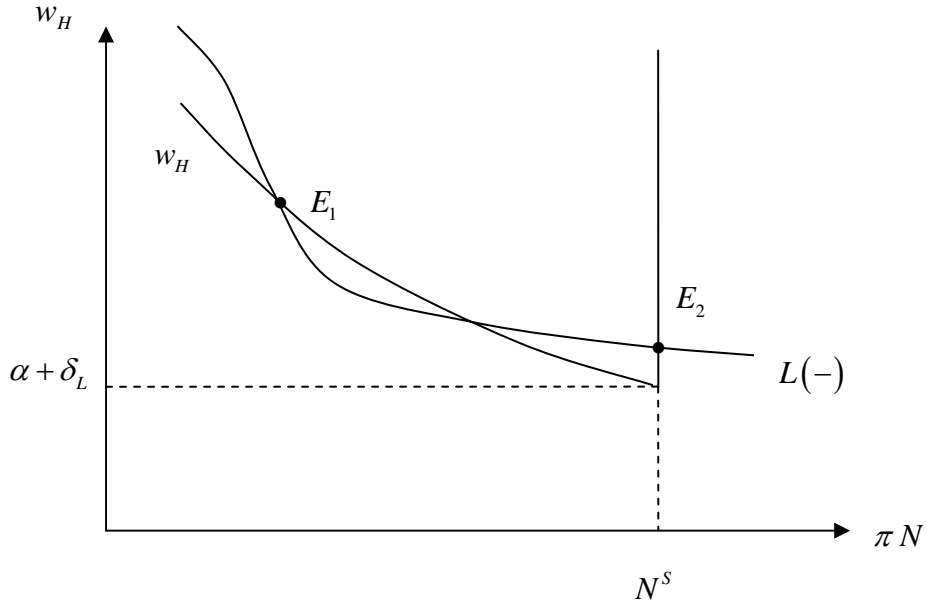
Conversely, this shift parameter can also be used for simulating the impact of a downturn in economic activity. Then, a fall in K would shift the $L(-)$ curve leftwards, increasing the level of skilled-labor under-employment, and boosting the supply of terrorists. These predictions are consistent with the empirical evidence presented by Blomberg *et al.* (2004) and Li (2005), cited above. Pushing this exercise to the limit shows that cutting K by a large enough amount would destroy the equilibrium altogether, were the $L(-)$ curve to fall entirely below the wage floor. This would produce the case of “peaceful stagnation” briefly described in the previous section, with neither terrorists nor educated workers. This state of affairs is somehow reminiscent of the situation prevailing in Sub-Saharan Africa, where the level of education is very low in most countries, while the supply of terrorists is negligible. This result underscores that the true challenge raised by the current discussion is to devise counter-terrorist strategies that are consistent with economic development, as the latter requires a massive upgrading of labor through education. Notice however that a similar result could be obtained by a policy of excessive empowerment of unskilled labor, through an excessive increase in α . But then, the distinction between skilled and unskilled labor used up to this point might become a purely semantic issue.

These comparative-static results are summarized in table 2, while their algebraic derivation is presented in the appendix.

Table 2: Impact on the Supply of Terrorists

Increase in:	α	δ_L	V_H	K
Response of the supply of terrorists:	+	+	Non monotonic (0, +, -)	-

These comparative-statics predictions are quite robust to a simple extension of the equilibrium outcome depicted at figure 2. Because the wage curve is forward falling in the relevant range, this model allows for multiple equilibria. Figure 3 depicts such an outcome. Now, we have two stable equilibria in figure 3, and one unstable one in between that can be neglected. The E_1 equilibrium is a bad one, as it entails a positive supply of terrorist attacks. It is similar to the one depicted at figure 2. By contrast, in the E_2 equilibrium, all the educated workers get a high-paying job, and none of them goes for a terrorist mission.

**Figure 3: Multiple Equilibria in the Skilled-Labor Market**

All the comparative-statics results derived above remain valid for the E_1 equilibrium, but the multiplicity of equilibria is opening one additional avenue for affecting the supply of terrorism. The relevant question to ask is then why is the skilled-labor market trapped in such

a bad equilibrium situation? As usual in many cases of multiple equilibria, the answer is involving beliefs. Because workers believe that π is low, they only acquire education if they expect a high w_H to prevail in equilibrium. This in turn puts the wage floor too high for letting full employment prevail on this segment of the labor market. What is needed is a “placebo” policy, whereby some skilled-labor employment-boosting policy is accompanied by a heavy propaganda announcing the return of full employment. It is then rational for the educated workers to believe in the latter, provided the other workers also believe this. This would eradicate “high-quality” terrorism. How much faith should the policy-maker put in such a multiple equilibria story is a matter of judgment.

6. Conclusion

This short paper has analyzed a very simple labor-market equilibrium model where some of the educated workers choose to engage in terrorism rather than accepting to work in a low-paying job. This model is thus taking into account some stylized facts that came out of recent empirical work on the supply of terrorists. The puzzle raised by these data is the issue of the “quality of terror” (Bueno de Mesquita, 2005). Some data analyzed by Krueger and Maleckova (2003) have brought out the fact that most terrorists, especially in the Middle East, come from relatively wealthy families, and have an above-average level of education. This is especially puzzling because suicide-bombing has become more frequent than before over the last two decades. One is then tempted to regard as irrational the path that leads these people to invest first in education, and then to blow up the resulting human capital in a terrorist attack. The present model provides some simple microeconomic foundations for such a behavior, by making endogenous the choice of investing in education. The model assumes that the latter does two things to people who invest in it: (i) it changes their worldview, and (ii) it increases the probability that they get a high-paying job offer. Some of them become more militant as a response to their changed worldview, and thus attach a higher value to terrorism. This in turn affects the wage floor below which investing in education is worthless. This type of educated workers would not accept to work for a too low wage rate, given the alternative of going for a highly valued terrorist mission. Hence, the latter is providing the prospective students with

some partial insurance against a bad draw in the high-paying job market, thus affecting positively the rate of return on education. This wage floor in turn may prevent this segment of the labor market from clearing with the whole educated workforce employed in high-paying jobs. A part of it might only get low-paying job offers, and the most militant of them would then choose to engage in terrorism.

This model provides some clear policy prescriptions. It suggests that the most powerful tool against terrorism would be to use aid for boosting the demand for skilled labor. Notice that this is not an unqualified support given to foreign aid, as it requires that the aid flow should be precisely targeted at enhancing the demand for skilled labor only. Another useful policy would aim at reducing the cost of investing in education for the relevant people, which could also lead to an increase in the equilibrium employment level for the educated workers, and thus to a fall in the supply of “high-quality” terrorists. Similarly, the model suggests that accepting more educated immigrants from poor countries in the north might lead to a reduction in the supply of “high-quality” terrorism. This model leads to a less enthusiastic prognosis regarding the two main types of policies which have been discussed previously in the literature about curbing terrorism. The first one is the fight against poverty by enhancing the productivity of the uneducated workers. Such a policy would backfire, according to the present model, because it would raise the wage floor that the relevant type of workers require for investing in education, with a negative impact on demand. Hence, in equilibrium, a large proportion of the educated ones would end up without a high-paying job offer, and might choose terrorism rather than work for a low wage. This argument is thus running counter to a wide-spread view that foreign aid should aim at fighting poverty. Repressive counter-terrorist policies, widely discussed under the “crackdown” heading, are predicted here to have a complicated impact. The present model predicts that a piecemeal approach to crackdown would lead to a perverse increase in the supply of terrorists, i.e. give rise to a process of radicalization. Only a massive effort could be effective, for eradicating terrorism completely. Hence, the model produces a fairly ambivalent prognosis regarding the impact of repression, and brings out the restrictive conditions required for making it effective.

This analytical framework is thus leading to some fairly counter-intuitive predictions, which are based on the interaction between the working of the educated-labor market and the choice of acquiring the relevant level of education. In the real world, such interactions do not work out instantly, so that the model should be viewed as dealing with medium-run issues, and does not shed much light on short-run labor-market matters. Within this framework, once the education decision is made endogenous, then the fact that most of the terrorists have in fact a relatively high level of education becomes less of a puzzle. Because some of the educated workers become highly militant as a response to the education acquired, the value of investing in education remains high for the prospective students, even if they are facing a pretty poor prospect of getting a high-paying job. Of course, the model is highly simplified, for the sake of tractability. Further research should be devoted to extending this model with a view to check how robust these predictions are. In particular, foreign direct investment could be made endogenous, creating a virtuous circle so that a fall in terrorism could attract some investors, leading in turn to a further fall in terrorism. Then aid policy could be conceived as a trigger, which would jump-start such a process of endogenous reduction in the supply of “high-quality” terrorism.

Appendix

The equilibrium number of terrorists is $N^T = \mu(1-\pi)N^S$, while (9) and (10) hold simultaneously. Then, some tedious calculations show that the comparative static multipliers for a stable equilibrium with $\pi < 1$ are given by:

$$\frac{\partial N^T}{\partial \alpha} = -\mu L(-) \left(\frac{\pi \left(\frac{\partial L}{\partial \alpha} + \frac{\partial L}{\partial w_H} \left(1 + \mu \frac{1-\pi}{\pi} \right) \right)}{\pi L + \frac{\partial L}{\partial w_H} (\delta_L - \mu(V_H - \alpha))} \right) > 0, \quad (\text{A.1})$$

$$\frac{\partial N^T}{\partial \delta_L} = \frac{-\mu L(-) \frac{\partial L}{\partial w_H}}{\pi L + \frac{\partial L}{\partial w_H} (\delta_L - \mu(V_H - \alpha))} > 0, \quad (\text{A.2})$$

$$\frac{\partial N^T}{\partial V_H} = \frac{\mu^2 (1-\pi) L(-) \frac{\partial L}{\partial w_H}}{\pi L + \frac{\partial L}{\partial w_H} (\delta_L - \mu(V_H - \alpha))} < 0, \quad (\text{A.3})$$

$$\frac{\partial N^T}{\partial K} = \frac{-\mu L(-) \frac{\partial L}{\partial K}}{\pi L + \frac{\partial L}{\partial w_H} (\delta_L - \mu(V_H - \alpha))} < 0, \quad (\text{A.2})$$

The signs attributed to these derivatives rest on the assumption that the stability condition (11) holds, as it should be according to Samuelson's correspondence principle.

References

- Akerlof, George A. (1983): "Loyalty Filters", *American Economic Review*, 73 (1), 54-63.
- Azam, Jean-Paul (2005): "Suicide-Bombing as Inter-Generational Investment", *Public Choice*, 122 (1-2), 177-198.
- Blomberg, S. Brock, Gregory D. Hess and Akila Weerapan (2004): "Economic Conditions and Terrorism", *European Journal of Political Economy*, 20 (2), 463-478.
- Bueno de Mesquita, Ethan (2005): "The Quality of Terror", *American Journal of Political Science*, 49 (3), 515-530.
- Guesnerie, Roger (2001): "Short-Run Expectational Coordination: Fixed versus Flexible Wages", 116 (3), 1115-1147.
- Huntington, Samuel P. (1968): *Political Order in Changing Societies*, (new edition 2006), Yale University Press: New Haven, CT.
- Krueger, Alan B. and Jitka Maleckova (2003): "Education, Poverty and Terrorism: Is There a Causal Connection?", *Journal of Economic Perspectives*, 17 (4), 119-144.
- Lévy, Bernard-Henri (2003): *Qui a tué Daniel Pearl?*, Grasset : Paris (translated as: *Who Killed Daniel Pearl ?*, Melville House: Hoboken, NJ, 2004).
- Li, Quan (2005): "Does Democracy Promote or Reduce Transnational Terrorist Incidents?", *Journal of Conflict Resolution*, 49 (2), 278-297.

- Ly, Pierre-Emmanuel (2006): "The Charitable Activities of Terrorist Organizations", *Public Choice*, forthcoming.
- Paz, Reuven (2000): "Higher Education and the Development of Palestinian Islamic Groups", *Middle East Review of International Affairs*, 4 (2), 81-94.
- Reuter, Christoph (2004): *My Life is a Weapon. A Modern History of Suicide Bombing*, Princeton University Press: Princeton.
- Rosendorff, B. Peter, and Todd Sandler (2004): "Too Much of a Good Thing? The Proactive Response Dilemma", *Journal of Conflict Resolution*, 48 (5), 657-671.
- Sachs, Jeffrey (2005): *The End of Poverty. How We Can Make it Happen in Our Lifetime*, Penguin Books: London.
- Stern, Jessica (2003): *Terror in the Name of God. Why Religious Militants Kill*, HarperCollins: New York.
- Victoroff, Jeff (2005): "The Mind of a Terrorist: A Review and Critique of Psychological Approaches", *Journal of Conflict Resolution*, 49 (1), 3-42.